

WHAT IS CLAIMED IS:

1. A microwave phase shifter comprising:

5 a circuit board on which a transmission line to transmit a microwave signal is formed on one surface of a semi-insulating layer, a first conductive layer is formed on the other surface, a second conductive layer is formed on a forming surface of the transmission line with an end portion set in close proximity to one side of the transmission line, and an active layer is formed under a forming portion of the transmission line in the semi-insulating layer; and

10 bias circuit which applies bias voltage to the transmission line.

2. The microwave phase shifter according to claim 1, wherein the bias circuit grounds the first and second conductive layers and applies a bias voltage of negative polarity to the transmission line.

3. The microwave phase shifter according to claim 1, wherein the bias circuit variably controls the bias voltage in a continuous or stepwise fashion.

4. A microwave phase shifter comprising:

25 a circuit board on which a transmission line to transmit a microwave signal is formed on one surface of a liquid crystal dielectric layer, a first conductive layer is formed on the other surface, and a second conductive layer is formed on a forming surface of the transmission line with an end portion set in close

proximity to one side of the transmission line; and  
bias circuit which applies bias voltage to the  
transmission line.

5        5. The microwave phase shifter according to  
claim 4, wherein the bias circuit grounds the first and  
second conductive layers and applies a bias voltage  
whose polarity is periodically inverted to the  
transmission line.

10       6. The microwave phase shifter according to  
claim 4, wherein the bias circuit variably controls the  
bias voltage in a continuous or stepwise fashion.

7. A power amplifier comprising:  
distributor which distributes a microwave signal  
to a plurality of transmission paths;  
15       a plurality of amplifiers respectively provided in  
the plurality of transmission paths to power-amplify  
the transmission signals;

phase adjusting circuit which adjusts signal  
propagation phases between the plurality of  
20       transmission paths by using any one of the plurality of  
transmission paths as a reference path, providing phase  
shifters in at least the other paths and adjusting  
phase shift amounts of the phase shifters; and

synthesizer which synthesizes the signals power-  
25       amplified by the plurality of amplifiers at ends of the  
plurality of transmission paths;

wherein the phase shifter includes a circuit board

on which a transmission line to transmit a microwave signal is formed on one surface of a semi-insulating layer, a first conductive layer is formed on another surface, a second conductive layer is formed on a forming surface of the transmission line with an end portion set in close proximity to one side of the transmission line, and an active layer is formed under a forming portion of the transmission line in the semi-insulating layer, and bias circuit applies bias voltage to the transmission line, and

the phase adjusting circuit supplies a bias voltage corresponding to the phase shift amount to the phase shifter.

8. The power amplifier according to claim 7, wherein the bias circuit grounds the first and second conductive layers and applies a bias voltage of negative polarity to the transmission line.

9. The power amplifier according to claim 7, wherein the bias voltage is variably controlled in a continuous or stepwise fashion.

10. The power amplifier according to claim 7, wherein the phase shifter is arranged on the output side of the power amplifier.

11. The power amplifier according to claim 7, wherein the phase adjusting circuit includes a monitor which monitors an output signal of the synthesizer and a control device which controls a voltage value of

the bias voltage based on the monitoring result of the monitor.

12. A power amplifier comprising:

5 distributor which distributes a microwave signal to a plurality of transmission paths;

a plurality of amplifiers respectively provided in the plurality of transmission paths to power-amplify the transmission signals;

10 phase adjusting circuit which adjusts signal propagation phases between the plurality of transmission paths by using any one of the plurality of transmission paths as a reference path, providing phase shifters in at least the other paths and adjusting phase shift amounts of the phase shifters; and

15 synthesizer which synthesizes the signals power-amplified by the plurality of amplifiers at ends of the plurality of transmission paths;

20 wherein the phase shifter includes a circuit board on which a transmission line to transmit a microwave signal is formed on one surface of a liquid crystal dielectric layer, a first conductive layer is formed on the other surface, and a second conductive layer is formed on a forming surface of the transmission line with an end portion set in close proximity to one side of the transmission line, and bias circuit for applying  
25 bias voltage to the transmission line, and

the phase adjusting circuit supplies a bias

voltage corresponding to the phase shift amount to the phase shifter.

13. The power amplifier according to claim 12, wherein the bias circuit grounds the first and second  
5 conductive layers and applies bias voltage whose polarity is periodically inverted to the transmission line.

14. The power amplifier according to claim 12, wherein the bias circuit variably controls the bias  
10 voltage in a continuous or stepwise fashion.

15. The power amplifier according to claim 12, wherein the phase shifter is arranged on the output side of the power amplifier.

16. The power amplifier according to claim 12, wherein the phase adjusting circuit includes a monitor  
15 which monitors an output signal of the synthesizer and a control device which controls a voltage value of the bias voltage based on the monitoring result of the monitor.

20 17. A circuit board of a microwave phase shifter comprising:

a semi-insulating layer;

a transmission line formed on one surface of the semi-insulating layer to transmit a microwave signal;

25 a first conductive layer formed on the other surface of the semi-insulating layer;

a second conductive layer formed on a transmission

line forming surface of the semi-insulating layer with an end portion set in close proximity to one side of the transmission line;

an active layer formed under a transmission line forming portion in the semi-insulating layer;

a ground terminal to which the first and second conductive layers are connected; and

a bias voltage input terminal to which the transmission line is connected.

18. A circuit board of a microwave phase shifter comprising:

a liquid crystal dielectric layer;

a transmission line formed on one surface of the liquid crystal dielectric layer to transmit a microwave signal;

a first conductive layer formed on the other surface of the liquid crystal dielectric layer;

a second conductive layer formed on a transmission line forming surface of the liquid crystal dielectric layer with an end portion set in close proximity to one side of the transmission line;

a ground terminal to which the first and second conductive layers are connected; and

a bias voltage input terminal to which the transmission line is connected.